

WHAT IS CLAIMED:

1. A temperature control for adjusting the temperature of a workstation and a work medium at a workstation to a predetermined temperature, comprising:

workstation temperature sensing means to determine the temperature of the workstation,

a source of fluid coolant and means for maintaining the fluid coolant at a temperature below said predetermined temperature,

coolant circulating means comprising a flow line delivering coolant from said source and to and through the workstation and adjusting the temperature of the workstation and work medium therein,

a coolant heater in the flow line heating the coolant being supplied to the workstation to a temperature nearly equal to said predetermined temperature as to maintain the workstation and work medium at said predetermined temperature,

and control means for the heater and modulating the heating thereof, said control means reducing the heating by said heater while a substantial differential exists between the workstation temperature and said predetermined temperature, and said control means increasing the heating by said heater as said differential decreases and as the workstation temperature nearly achieves said predetermined temperature.

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2. A temperature control as in claim 1, further comprising means for regulating the flow of coolant in the flow line.

3. A temperature control as in claim 2, further comprising means for bypassing said flow regulating means and said heater, and wherein said control means controls said bypass means.

4. A temperature control as in claim 3, wherein said control means is a temperature control computer, and the computer's program controls said heater and said bypass means.

5. A temperature control as in claim 1, wherein said temperature control controls the temperature of a plurality of workstations and work media therein.

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6. A temperature control for adjusting the temperature of a workstation and a work medium at a workstation to a predetermined temperature, comprising:

a workstation,

workstation temperature sensing means to determine the temperature of the workstation,

a source of fluid coolant and means for maintaining the fluid coolant at a temperature below said predetermined temperature,

coolant circulating means comprising a flow line delivering coolant from said source and to and through the workstation and producing cooling of the workstation and work medium therein,

a coolant heater in the flow line heating the coolant being supplied to the workstation to a temperature nearly equal to said predetermined temperature as to maintain the workstation and work medium at said predetermined temperature,

and control means for the heater and modulating the heating thereof, said control means reducing the heating by said heater while a substantial differential exists between the workstation temperature and said predetermined temperature, and said control means increasing the heating by said heater as said differential decreases and as the workstation temperature nearly achieves said predetermined temperature.

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7. A temperature control as in claim 6, further comprising means for regulating the flow of coolant in the flow line.

8. A temperature control as in claim 7, further comprising means for bypassing said flow regulating means and said heater, and wherein said control means controls said bypass means.

9. A temperature control as in claim 8, wherein said control means is a temperature control computer, and the computer's program controls said heater and said bypass means.

10. A temperature control as in claim 6, wherein said workstation comprises a cooling plate for supporting a wafer whose temperature is to be regulated.

11. A temperature control as in claim 6, wherein said workstation comprises a cylindrical collar encompassing a shaft to be cooled, said shaft being connected to an electric motor at one end, and said shaft having a chuck at the end of said shaft distal from said motor, said chuck supporting a wafer whose temperature is to be regulated.

12. A temperature control as in claim 6, wherein said workstation comprises a liquid-to-liquid heat exchanger for regulating the temperature of a fluid passing through said heat exchanger.

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13. A temperature control as in claim 6, wherein said workstation comprises a module having an upper compartment, a lower compartment, and a cooling plate separating said upper compartment from said lower compartment, said module regulating the temperature of materials in said upper compartment and said lower compartment.

14. A temperature control as in claim 6, wherein said temperature control controls the temperature of a plurality of workstations and work media therein.

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15. A temperature control for adjusting the temperature of a workstation and a work medium at a workstation to a predetermined temperature, comprising:

a source of fluid coolant,

a cooling vehicle, main coolant temperature sensor and main coolant temperature control for detecting and maintaining the temperature of the fluid coolant at a temperature below said predetermined temperature,

a flow line, a return line, and a recirculating pump for receiving fluid coolant from said source of fluid coolant and providing fluid coolant to the workstation and producing cooling of the workstation and work medium therein,

a workstation temperature sensor and workstation temperature control for detecting and regulating the temperature of the workstation,

a coolant heater in said flow line responsive to said workstation temperature control for heating the coolant being supplied to the workstation to a temperature nearly equal to said predetermined temperature as to maintain the workstation and work medium at said predetermined temperature,

said workstation temperature control reducing the heating by said heater while a substantial differential exists between the workstation temperature and said predetermined temperature, and said workstation temperature control increasing the heating by said heater as said differential decreases

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and as the workstation temperature nearly achieves said predetermined temperature,

a flow regulator in said flow line for maintaining the desired rate of flow of coolant through said flow line, and

a bypass valve for bypassing both said heater and said flow regulator, thereby providing a flow of unwarmed coolant to the workstation at an increased rate of flow, said bypass valve being responsive to said workstation temperature control.

16. A temperature control as in claim 15, wherein said main coolant temperature control and said workstation temperature control are a temperature control computer.

17. A temperature control as in claim 15, wherein said temperature control controls the temperature of a plurality of workstations and work media therein.

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18. A temperature control for adjusting the temperature of a workstation and a work medium at a workstation to a predetermined temperature, comprising:

a workstation,

a source of fluid coolant,

a cooling vehicle, main coolant temperature sensor and main coolant temperature control for detecting and maintaining the temperature of the fluid coolant at a temperature below said predetermined temperature,

a flow line, a return line, and a recirculating pump for receiving fluid coolant from said source of fluid coolant and providing fluid coolant to the workstation and producing cooling of the workstation and work medium therein,

a workstation temperature sensor and workstation temperature control for detecting and regulating the temperature of the workstation,

a coolant heater in said flow line responsive to said workstation temperature control for heating the coolant being supplied to the workstation to a temperature nearly equal to said predetermined temperature as to maintain the workstation and work medium at said predetermined temperature,

said workstation temperature control reducing the heating by said heater while a substantial differential exists between the workstation temperature and said predetermined temperature, and

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said workstation temperature control increasing the heating by said heater as said differential decreases and as the workstation temperature nearly achieves said predetermined temperature,

a flow regulator in said flow line for maintaining the desired rate of flow of coolant through said flow line, and

a bypass valve for bypassing both said heater and said flow regulator, thereby providing a flow of unwarmed coolant to the workstation at an increased rate of flow, said bypass valve being responsive to said workstation temperature control.

19. A temperature control as in claim 18, wherein said workstation comprises a cooling plate for supporting a wafer whose temperature is to be regulated.

20. A temperature control as in claim 18, wherein said workstation comprises a cylindrical collar encompassing a shaft to be cooled, said shaft being connected to an electric motor at one end, and said shaft having a chuck at the end of said shaft distal from said motor, said chuck supporting a wafer whose temperature is to be regulated.

21. A temperature control as in claim 18, wherein said workstation comprises a liquid-to-liquid heat exchanger for regulating the temperature of a fluid passing through said heat exchanger.

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22. A temperature control as in claim 18, wherein said workstation comprises a module having an upper compartment, a lower compartment, and a cooling plate separating said upper compartment from said lower compartment, said module regulating the temperature of materials in said upper compartment and said lower compartment.

23. A temperature control as in claim 18, wherein said main coolant temperature control and said workstation temperature control are a temperature control computer.

24. A temperature control as in claim 18, wherein said temperature control controls the temperature of a plurality of workstations and work media therein.

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25. A process for precisely cooling a workstation and a work medium at a workstation to a predetermined temperature, comprising the steps of:

rapidly lowering the temperature of the workstation by means of a fluid coolant whose temperature is below the predetermined temperature, until the temperature of the workstation approaches the predetermined temperature, and

introducing heat into the coolant flowing to the workstation, thus slowing the rate of cooling, until the predetermined temperature is achieved.

26. The process as in claim 25, wherein the temperature of a plurality of workstations is controlled.

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